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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/854,924	05/14/2001	Toshihisa Yokoyama	782_163	7936

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EXAMINER
SONG, MATTHEW J

ART UNIT	PAPER NUMBER
1765	12

DATE MAILED: 06/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

mv-17

Office Action Summary	Application No.	Applicant(s)	
	09/854,924	YOKOYAMA ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 27 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 27 recites, "said cooling mechanism directly cools only said oxide single crystal". There is no support in the instant specification for cooling only the oxide single crystal. The specification merely states cooling the oxide single crystal and does not positively recite other cooling of other portions of the crystal does not occur.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaeda et al (US 5,919,304) in view of Ciszek et al (US 4,075,055).

Imaeda et al discloses melting a raw material of potassium carbonate, lithium carbonate and niobium oxide in an upper furnace at a temperature of 1100-1200°C and a lower furnace at a temperature of 500-1000°C (col 14, ln 45-67 and Fig 9). Imaeda et al also discloses a nozzle portion of a crucible, a driving mechanism for holding and moving a seed crystal and a mechanism for moving a grown oxide series single crystal (col 15, ln 1-14 and Fig 9). Imaeda et al also discloses at the time of seeding, a seed crystal is contacted to a surface of a melt at the lower end of a nozzle portion and a single crystal fiber was grown at a contact rate of 80 mm/hr by a mu pulling down method (col 15, ln 15-50 and col 17, ln 45-58). Imaeda et al also discloses a quality of a single crystal can be maintained by obtaining a single crystal under a gradual annealing of a low cooling rate of 100-400°C/hr.

Imaeda et al does not teach providing a cooling mechanism for directly cooling the oxide single crystal.

In a method of growing a crystal ribbon from a die, Ciszek et al teaches for wider ribbons of greater than 4 centimeters auxiliary cooling techniques are required to assure he desired temperature distribution across the crystal at the solid liquid interface during growth, where cooling is achieved by directing a flow of inert gas in different controlled amounts to different segments of the liquid solid crystal interface so as to maintain the desired growth temperature across the growing body's interface (col 5, ln 1-40). It would have been obvious to a person of

ordinary skill in the art at the time of the invention to modify Imaeda et al with Ciszek et al's cooling because larger ribbons are formed.

Referring to claim 2, the combination of Imaeda et al and Ciszek et al teaches cooling, where cooling inherently removes ambient heat.

Referring to claim 3, the combination of Imaeda et al and Ciszek et al teaches a flow of inert gas.

Referring to claim 4-5, the combination of Imaeda et al and Ciszek et al teaches a nozzle at the tip of a crucible.

Referring to claim 6-9, the combination of Imaeda et al and Ciszek et al teaches a fiber and a ribbon, this reads on applicant's planar form.

5. Claims 1-9 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mimura et al (US 4,367,200) in view of Shudo et al (US 4,264,407).

Mimura et al discloses an oxide single crystal manufacturing method (col 5, ln 35-40) comprising the step of melting a raw material in a crucible **2** (col 2, ln 50-65), contacting a seed crystal and lowering a growing crystal using rollers **13**, this reads on applicant's pulling down the seed crystal (col 5, ln 15-20 and col 2, ln 60-65). Mimura et al also discloses employing a cooling liquid or like means for cooling the grown crystal (col 4, ln 20-25). Mimura et al also teaches a nozzle part **8** and growing fibrous or ribbon-like single crystals, this reads on applicant's planar form (col 6, ln 1-5 and col 3, ln 55-60).

Mimura et al discloses a means for cooling the grown crystal. Mimura et al does not disclose a cooling mechanism for directly cooling the single crystal.

In a method of cooling crystal ribbons, note entire reference, Shudo et al teaches a cooling means may comprise a conduit and plurality of nozzles, through which a gaseous medium is blown over the surface of the grown crystal, this reads on applicant's direct cooling, and the cooling rate may be easily be changed during the operation by varying the flow rate of the gaseous medium (col 3, ln 60-68). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Mimura et al with Shudo's cooling mechanism because the cooling rate can be easily controlled.

6. Claims 1-9 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaeda et al (US 5,690,734) in view of Shudo et al (US 4,264,407).

Imaeda et al discloses a growing single crystal oxides utilizing a downward pulling process (col 14, ln 5-65) comprising a crucible **20**, a nozzle portion **25,** a seed crystal **27** which is moved upwardly, contacting the surface of a melt and pulled downward (col 21, ln 1-45). Imaeda et al also discloses forming a planar single crystal **36** (col 21, ln 45-50). Imaeda et al also discloses the single crystal can be rapidly cooled in the vicinity of the single crystal growing section (col 8, ln 10-30).

Imaeda et al discloses the single crystal may be rapidly cooled. Imaeda et al does not disclose a cooling mechanism.

In a method of cooling crystal ribbons, note entire reference, Shudo et al teaches a cooling means may comprise a conduit and plurality of nozzles, through which a gaseous medium is blown over the surface of the grown crystal, this reads on applicant's direct cooling, and the cooling rate may be easily be changed during the operation by varying the flow rate of

the gaseous medium (col 3, ln 60-68). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Imaeda et al with Shudo's cooling mechanism because the cooling rate can be easily controlled.

Double Patenting

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. Claims 1-9 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 13, 22 and 26 of U.S. Patent No. 6,565,654 in view of Shudo et al (US 4,264,407). Although the conflicting claims are not identical, they are not patentably distinct from each other because US 6,565,654 claims a process for producing a planar body of an oxide single crystal comprising the steps of melting a raw material in a crucible, contacting a seed crystal, pulling down the seed crystal and a plurality of devices for supplying a cooling medium in a position facing a nozzle. US 6,565,654 does not claim the cooling medium directly cools the single crystal. Shudo et al teaches a method of growing crystal ribbons using a cooling means comprising a plurality of nozzles through which a gaseous

medium is blown over the surface of the grown crystal, this reads on directly cooling (col 3, ln 60-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,565,654 with Shudo et al's direct cooling to remove heat effectively, thereby improving productivity ('407 col 2, ln 20-35).

Response to Arguments

9. Applicant's arguments filed 4/10/2003 have been fully considered but they are not persuasive.

Applicant's argument that skilled artisans would not have been motivated to use Ciszek's step of blowing a cooling medium directly onto the liquid-solid crystal interface portion in Imaeda's method of forming oxide single crystals has been noted but has not been found persuasive. The applicant's argument is based on blowing a cooling medium directly on to the liquid solid crystal interface portion necessarily produces a more rapid change in the temperature at the liquid solid crystal interface, which is undesirable based on the teaching of Imaeda. Imaeda teaches the cooling rate is preferably not more than 1000°C/hr to prevent cracks caused by thermal stresses, note column 8, lines 1-10. Ciszek teaches a technique of blowing an inert gas in different controlled amounts to different segments of the liquid solid crystal interface so as to maintain the desired growth temperature across the growing body's interface and assuring the desired temperature distribution across the crystal at the solid liquid interface during growth, note column 5, lines 5-20. Also, Ciszek et al teaches thermal stresses result if a uniform temperature across the crystal at the growing interface is not maintained, note column 7, lines 63-66. Therefore, Ciszek's technique of blowing inert gas to the liquid solid crystal interface to

maintain a desired temperature distribution does not cause thermal stresses, as suggested by applicant, but reduces the thermal stresses.

Applicant's argument that a silicon single crystal has different properties than an oxide single crystal, therefore skilled artisans would not conclude that Ciszek's cooling gas technique could be used the oxide single crystal of Imaeda et al has been considered but has not been found persuasive. Differences in the thermal properties of silicon and oxide single crystals is noted, however one of ordinary skill in the art would have been motivated to modify Imaeda et al with Ciszek's cooling technique to grow larger crystals. Also, a decrease in crystallinity may result, however the desire for larger crystals would motivate one of ordinary skill in the art to use Ciszek's technique. Furthermore, Mimura et al teaches a cooling liquid or like means for cooling a grown crystal to increase the temperature gradient in the solid liquid interface when growing oxide single crystals (col 4, ln 20-25 and col 5, ln 35-40). Based on the teaching of Mimura et al, cooling of the solid liquid interface was known prior to applicant's invention, which is contrary to applicant's argument that one of ordinary skill would not cool the solid liquid interface of an oxide single crystal.

10. The declaration under 37 CFR 1.132 filed 4/10/2003 is insufficient to overcome the rejection of claims 1-9 based upon the combination of Imaeda et al and Ciszek et al as set forth in the last Office action because the statement that it would have been unobvious to modify Imaeda et al with Ciszek et al and claimed invention was unobvious to Mr. Imai is merely an opinionary statement made by a co-inventor of the instant application and is given little weight. Furthermore, the Examiner does not dispute oxide single crystal and silicon single crystals have

different thermal conductivity and coefficients of thermal conductivity based on the evidence provided (item 5). The statement regarding the unobviousness of modifying Imaeda et al with Ciszek cooling gas because an undesirable temperature gradient would be produced has been considered but has not been found persuasive. Ciszek teaches a technique of blowing an inert gas in different controlled amounts to different segments of the liquid solid crystal interface so as to **maintain the desired growth temperature** across the growing body's interface and assuring the **desired** temperature distribution across the crystal at the solid liquid interface during growth, note column 5, lines 5-20. The cooling gas of Ciszek does not produce temperature gradients, as suggested, and is used to ensure a **desired** temperature distribution across the crystal. Also, providing a means for cooling a grown oxide crystal is taught by the prior art, note Mimura et al US 4,367,200, which is contradictory to the statement that it would have been unobvious to one of ordinary skill in the art to cool an oxide single crystal. The statement that oxide single crystal would **not necessarily** produce the benefits taught by Ciszek et al because of the difference in properties has been considered but has not been found persuasive. The statement that the benefits would **not necessarily** produce the benefits taught is not sufficient to dissuade a person of ordinary skill because the benefits may occur, which is sufficient motivation.

In view of the foregoing, when all of the evidence is considered, the totality of the rebuttal evidence of nonobviousness fails to outweigh the evidence of obviousness.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS
June 2, 2003

BENJAMIN L. UTECH
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